Improving Educational Quality (IEQ) Project

EFFECTS OF HOME LANGUAGE ON PUPILS' PERFORMANCE IN MATHEMATICS: A FOCUS OF IEQ/MALAWI PROJECT

IEQ undertaken by:

American Institutes for Research

in collaboration with
The Academy for Educational Development
Education Development Center, Inc.
Juárez and Associates, Inc.
The University of Pittsburgh

Report prepared by:
Elias Kaphesi

March 2001

Contract #HNE-I-00-97-00029-00

Table of Contents

INTRODUCTION

IEQ is collaborating with the Malawian Ministry of Education and Save the Children (US) to re-examine Malawi's current quality of learning in primary schools. Among the issues being focused on is the impact of school language policy on quality of learning. The school language policy states that "…in the first four years of primary education, local languages to be used as medium of instruction and thereafter English is to be used as a medium of instruction" (Ministry of Education, 1996)

Efforts to implement this policy have met with numerous challenges. 16 different languages are spoken in Malawi (Chichewa Board, 1994). Teachers and pupils may not speak the same local Malawian languages. Teacher education programmes cannot equip students to teach in all the sixteen languages yet teachers are posted to teach at any school regardless of the language predominant in the area. Printed resources for teachers and pupils in Malawian languages are few and communities or teachers may directly or indirectly discourage the use of local languages in teaching activities, preferring that other languages be used instead.

THE EDUCATIONAL QUALITY STUDY

IEQ researchers are engaged in an educational quality study to inform the education policy dialogue and to improve quality of learning in primary education. A primary goal of improving educational quality is to generate knowledge about the factors influencing quality of learning in the classroom. Between February 1999 and October 1999 researchers carried out one baseline and follow up surveys as part of a three-year longitudinal study. Case study data were collected through systematic classroom observations, interviews with pupils, teachers, headteachers and parents, subject based tests with pupils and teachers in mathematics, English and Chichewa, survey of school equipment, staffing, enrolment and teaching and learning materials. Research teams conducted data collection in primary 2,3, and 4 at baseline and follow up in February and October respectively in 1999 and then in October 2000 where Malawian local languages were to be the medium of instruction.

RESEARCH PROBLEM

It is well known that language influences thought formation and that thought formation is the genesis of learning. Influence of language on mathematics learning is also extremely studied. Because of nature of mathematics i.e. teaching and learning mathematics is like teaching and learning a language in another language. This state of affairs became more challenging in multi lingual classes where both the teacher and their pupils do not share the same home language. In Malawi the problem can be unique for a number of reasons:

1. Chichewa is a national language, spoken by the majority and medium of instruction in most classes

2. Most languages are related because they belong to Bantu Family

3. Most of local languages are confined to homes

4. Most of the instructional materials are either in Chichewa or in English but very few are in other local languages

5. Teachers are sent to teach at any school in any area in Malawi regardless of their home language

6. There are pupils of different home languages in most of primary school classes.

RESEARCH QUESTIONS

One question has been explored in this paper: Does home language influence the quality of learning mathematics? This question is significant in a number of ways. Despite many known facts, Malawi did not put in place systematic strategies for implementing language policy in schools. Knowledge of how language is influencing mathematics learning may make the policy makers rethink the implementation strategies.

RESEARCH SAMPLE

69 primary schools in Balaka and Mangochi Districts were involved in the study. From these schools a total of 2208 pupils and 188 teachers were sampled. When sampling the schools, were stratified according to school community (urban, semi urban, rural and remote rural) and school size (pupil enrolment). Half of the pupils sampled were girls.

LEARNING QUALITY MEASUREMENT

Since pupil's performance is central to educational quality, all the pupils were assessed in mathematics, English and Chichewa at the beginning and at the end of the 1999 academic year.

LANGUAGE MEASUREMENT

Since learning most occurs in a language, all the possible sources of languages interaction with the teacher and the pupils were investigated. These included home languages of the teacher and pupils, teacher competencies in Chichewa and English and pupils fluency in English and Chichewa. Many factors shape the quality of teachers and teaching and learning. By attending to linguistic factors that influence pupils performance in mathematics, the Educational and Quality study expects to produce important information for improving the teaching and learning process at the primary level.

DATA COLLECTION PROCEDURES

Every pupil was assessed on mathematics, Chichewa and English. The skills which the pupils were assessed included. Individual pupils were taken from their classroom to a quiet place within the school grounds. Assessment procedures involved oral and reading questions and pupils were expected to respond orally or by writing. The period for assessing one child took about 30 minutes.

Immediately after assessment, a pupil was interviewed on various issues regarding home background such as home language. Teachers too were interviewed on issues of language. A subject knowledge based test was also administered to teachers in English and mathematics.

SUMMARY OF FINDINGS

PUPILS' HOME LANGUAGE AND MATHEMATICS LEARNING

Chichewa speaking pupils had a higher gain score than Chiyao speaking pupils but had a lower gain score than speakers of languages other than Chichewa and Chiyao. The non-Chiyao pupils gain in learning was less than the average gain score where as the gain score for the non-Chiyao speakers were more than the average gain score. The findings indicate that in this area the pupils who speak Chiyao at home do not learn as much mathematics as those who speak Chichewa and other languages.

Table 1: Influence of pupils' home language on pupils' learning gains in mathematics

Pupil Home Language	October 1999	February 1999	Gain Scores
Chichewa	52.16	43.48	8.68
Chiyao	48.76	41.58	7.18
Others	54.97	45.11	9.86
Total	50.29	42.43	7.86

TEACHER HOME LANGUAGE AND PUPILS PERFORMANCE IN MATHEMATICS

Pupils taught by teachers whose home language was Chichewa gained less than those pupils taught by teachers whose home language was Chiyao. Pupils taught by teachers whose home language was Chiyao gained less than those pupils taught by teachers whose home language was other than Chichewa or Chiyao. The gain scores for pupils taught by Chichewa and Chiyao speakers were both less than the gain scores for pupils taught by teacher whose home language was other than Chichewa

Table 2: Influence of teachers' home language on pupils' learning gains in mathematics

Teacher Home Language	October 1999	February 1999	Gain Scores
Chichewa	50.06	42.45	7.61
Chiyao	51.52	43.25	8.27
Others	48.61	39.33	9.28
Total	50.18	42.25	7.93

and Chiyao. The gain scores for pupils taught by teachers whose home languages were Chiyao and others were above average. Whereas the gain score for pupils taught by teachers whose home language was below average. From the findings, it can be deduced that in this sample, teachers whose home language was Chichewa were as not as effective as those whose home language was Chiyao or others in mathematics teaching.

PUPILS HOME LANGUAGE AND PUPIL PERFORMANCE IN MATHEMATICS BY STANDARD

In Standard 2, pupils whose home language was Chiyao made fewer gains than those whose home language was not Chiyao. Pupils whose home language was Chiyao made gains below class average. Pupils whose home language was neither Chichewa nor Chiyao made substantial gains as compared to other categories. Therefore Chiyao speaking pupils were at a disadvantage in mathematics learning.

In Standard 3, the differences in gain scores among the pupils whose home language were Chichewa, Chiyao and others were very small. The group had advantages over other groups. In Standard 4, those pupils whose home language was other than Chichewa and Chiyao made no gain at all. Pupils whose home language was Chichewa had gained more than those whose home language was Chiyao. Gain scores for Chiyao speaking pupils were below class average and for Chichewa speakers were above average. The results showed that mathematics learning favored the pupils whose home language was Chichewa.

Table 3: Pupils home language and pupils performance in mathematics by standard

Standard	Home language	October 1999	February 1999	Gain Scores
2	Chichewa	42.29	34.19	8.10
	Chiyao	39.42	33.15	6.27
	Others	42.44	29.35	13.09
	Total	40.59	33.48	7.11
3	Chichewa	56.27	46.63	9.64
	Chiyao	55.12	45.36	9.76
	Others	57.08	47.33	9.75
	Total	55.67	45.93	9.74
4	Chichewa	65.84	57.60	8.24
	Chiyao	63.30	57.18	6.12
	Others	64.67	64.67	0.00
	Total	64.67	57.56	6.91
Total	Chichewa	52.16	43.48	8.68
	Chiyao	48.76	41.58	7.18
	Others	54.97	45.11	9.86
	Total	50.29	42.43	7.86

TEACHER HOME LANGUAGE AND PUPILS PERFORMANCE IN MATHEMATICS BY STANDARD

In Standard 2 pupils taught by teachers whose home language was Chichewa gained less than those pupils taught by teachers whose home language was Chiyao and also others. Pupils taught by teachers whose home language was Chiyao gained more than pupils taught by teachers whose home language were not Chichewa or Chiyao. Pupils taught by teachers whose home language was Chichewa gained below class average whereas the other groups of pupils gained above class average gain. Teachers whose home language was Chiyao were more effective than non-Chiyao speaking teachers in mathematics teaching.

In Standard 3 pupils taught by teachers whose home language was Chiyao gained less than the other groups. Their gain score was also below class average. Pupils taught by teachers whose home language was Chichewa gained less than pupils taught by teachers whose home language was neither Chichewa nor Chiyao. A teacher whose home language was Chiyao was not as effective as other teachers in mathematics teaching.

In Standard 4 pupils taught by teachers whose home language was Chiyao gained less than other pupils did. The gain score was also below class average. Pupils taught by teachers whose home language was Chichewa gained less than pupils taught by teachers whose home language was not Chiyao or Chichewa. However, pupils taught by teacher whose home language was Chichewa and other languages not Chiyao gained above class average. The results show that teachers whose home language was Chiyao were not as effective as other teachers in mathematics teaching were.

Table 4: Teacher home language and pupils performance in mathematics by standard

Standard	Home language	October 1999	February 1999	Gain Scores
2	Chichewa	40.47	33.80	6.67
	Chiyao	43.46	33.64	9.82
	Others	37.92	29.52	8.4
	Total	40.80	33.27	7.53
3	Chichewa	55.62	45.71	9.91
	Chiyao	55.24	47.60	7.64
	Others	57.62	45.46	12.16
	Total	55.75	45.92	9.83
4	Chichewa	64.41	56.56	7.85
	Chiyao	66.27	62.56	3.71
	Others	64.08	54.59	9.49
	Total	64.78	57.57	7.21
Total	Chichewa	50.06	42.45	7.61
	Chiyao	51.52	43.25	8.27
	Others	48.61	39.33	9.28
	Total	50.18	42.25	7.93

Table 5: Interactive teacher and pupils home languages on mathematics learning gains in standard 2

Teacher home language	Pupils home language	Sample	October 1999 Scores	February 1999 Scores	Gain Scores
Chichewa	Chichewa	27	42.73	34.29	8.44
	Chiyao	6	38.35	33.66	4.69
	Other	26	42.67	29.30	13.37
	Total	508	40.35	33.88	6.47
Chiyao	Chichewa	26	45.88	35.76	10.12
	Chiyao	130	42.54	33.42	9.12
	Other	3	42.00	31.50	10.50
	Total	159	43.08	33.73	9.35
Others	Chichewa	47	38.15	32.92	9.23
	Chiyao	31	35.74	25.98	9.76
	Other	-	-	17.00	17.00
	Total	78	37.19	30.01	7.18
Total	Chichewa	299	42.29	34.19	8.10
	Chiyao	437	39.41	33.01	6.4
	Other	9	42.44	29.35	13.09
	Total	745	40.60	33.42	7.18

INTERACTIVE EFFECT OF TEACHERS AND PUPILS'HOME LANGUAGES ON PUPILS GAIN SCORES IN MATHEMATICS

In standard 2 pupils whose home language was Chiyao and were taught by a teacher whose home language was Chichewa made the least gains in mathematics learning. However, pupils who were taught by teachers whose home languages were Chiyao and others made substantial gains in mathematics learning regardless of the pupils' home languages (see Table 5)

Table 6: Interactive teacher and pupils home languages on mathematics learning gains in standard 3

Teacher home language	Pupils home language	Sample	October 1999 Scores	February 1999 Scores	Gain Scores
Chichewa	Chichewa	121	55.26	46.27	8.99
	Chiyao	159	55.14	45.25	9.89
	Other	10	58.00	47.08	10.92
	Total	290	55.29	45.74	9.55
Chiyao	Chichewa	12	60.92	46.46	14.46
	Chiyao	35	54.43	48.16	6.27
	Other	1	53.00	41.00	12.00
	Total	48	56.02	47.66	8.36
Others	Chichewa	16	57.56	50.57	6.99
	Chiyao	15	57.56	40.96	16.24
	Other	1	52.00	48.00	4.00
	Total	32	57.22	45.50	11.72
Total	Chichewa	149	55.97	46.77	9.2
	Chiyao	209	55.17	45.38	9.79
	Other	12	57.08	46.71	10.37
	Total	370	55.55	45.95	9.6

In standard 3, pupils whose home language was Chiyao and were taught by teachers whose home language was Chiyao made the least gains in mathematics learning but those taught by teachers whose home language was neither Chichewa nor Chiyao made large gains in mathematics learning. Pupils whose home language was Chichewa and were taught by teachers whose home language was Chiyao made substantial gains in mathematics learning whereas those taught by teachers whose home language was neither Chichewa nor Chiyao made the least gains in mathematics learning (see Table 6).

In standard 4 (see Table 7), pupils whose home language was Chichewa and were taught by teachers whose home language was Chichewa made the least gains in mathematics learning. Similarly, pupils whose home language was Chiyao and were taught by teachers whose home language was Chiyao made the least gains in mathematics learning. Again pupils whose home language was Chichewa and

Table 7: Interactive teacher and pupils home languages on mathematics learning gains in standard 4

Teacher home language	Pupils home language	Sample	October 1999 Scores	February 1999 Scores	Gain Scores
Chichewa	Chichewa	118	64.14	57.80	6.34
	Chiyao	114	62.08	54.72	7.36
	Other	5	62.20	56.14	5.16
	Total	237	64.11	56.44	7.67
Chiyao	Chichewa	20	64.85	59.31	5.54
	Chiyao	60	66.17	63.79	2.38
	Other	2	71.5	62.00	9.50
	Total	82	65.98	62.56	3.42
Others	Chichewa	24	64.96	54.24	10.72
	Chiyao	22	61.77	54.13	7.64
	Other	1	65.00	63.00	2.00
	Total	47	63.47	54.51	8.96
Total	Chichewa	162	65.81	57.49	8.32
	Chiyao	196	63.30	57.18	8.12
	Other	8	64.88	64.82	.06
	Total	366	64.44	57.49	6.95

Table 8: Interactive teacher and pupils home languages on mathematics learning gains in standards 2, 3 and 4

Teacher home language	Pupils home language	Sample	October 1999 Scores	February 1999 Scores	Gain Scores
Chichewa	Chichewa	465	51.94	43.33	8.61
	Chiyao	549	48.14	41.69	6.45
	Other	21	54.62	45.55	9.07
	Total	1035	49.98	42.50	7.48
Chiyao	Chichewa	58	55.53	46.05	9.48
	Chiyao	225	50.69	42.84	7.85
	Other	6	53.67	39.33	14.34
	Total	289	51.72	43.38	8.34
Others	Chichewa	87	49.11	41.60	7.51
	Chiyao	68	48.90	37.35	11.55
	Other	2	58.50	47.75	10.75
	Total	257	49.14	39.87	9.27
Total	Chichewa	610	51.88	43.33	8.55
	Chiyao	842	48.88	41.64	7.24
	Other	29	54.69	44.43	10.26
	Total	1481	50.23	42.39	7.84

were taught by teachers whose home language was Chiyao made the least gains in mathematics learning.

All the pupils whose home language was Chiyao and were taught by teachers whose home language was Chichewa made least gains in mathematics learning (see Table 8). However, pupils whose home language was neither Chichewa nor Chiyao and were taught by teachers whose home language was Chiyao made substantial gains in mathematics learning.

DISCUSSION

The data analysis process had limitations in that in some cases, the sample sizes were statistically too small for any statistical comparison. However, the available data revealed a number of issues about the effect of home language on mathematics learning.

The results of the study showed that mathematics learning does not favor pupils whose home language was Chiyao. Yet these pupils were in majority as Chiyao is the local language in most of the communities in Mangochi and Balaka districts.

The results also show that pupils taught by teachers whose home language was Chichewa were not as effective as others were in mathematics teaching. Yet the most common language of the classroom instruction was Chichewa. Maybe using Chiyao in mathematics teaching would enhance mathematics learning in these districts of Malawi.

Chiyao speaking pupils did not do very well as compared to other pupils in standards 2 and 4 although in Standard 3 the gain scores were not very different among pupils with different home languages. This finding indicates that pupils whose home language experience more problems in mathematics learning as compared to other pupils.

Teachers whose home language was Chiyao were more effective than non-Chiyao speaking in Standard 2 but not in Standard 3 and 4. The reason may be that the language of instruction is not as formal in standard 2 as is in standards 3 and 4. The more the language of instruction the less the use of Chiyao, the language of the majority of the pupils in the two districts.

From the results it appears that in all the three standards pupils whose home language was Chiyao and were taught by teachers whose home language was neither national nor local to the community made substantial gains in mathematics learning. However, in standards 3 and 4 where pupils and teachers shared the same home language pupils' gains in mathematics learning were below class average. It was also found out that in most cases when pupils whose home language was Chiyao and were taught by teachers whose home language was either Chichewa or Chiyao made gains below average.

CONCLUSION

From the findings of the study, it can be concluded that pupils whose home language is Chiyao have more problems with mathematics learning than other pupils. The problem is more compounded when they are taught by a teacher whose home language is Chichewa. Even when a teacher whose home language is Chiyao teaches them, this works only in Standard 2 but not in the higher classes perhaps due to demands for technical terms by mathematics that may not be readily available in Chiyao for classroom use.

The findings suggest that there is interplay between pupils and teachers home language on mathematics learning. However, the actual effect of home language on mathematics learning is overshadowed by other equally influential factors such as teacher competencies and pupils' abilities in mathematics and languages used in classroom instruction and others. Therefore there is need to do further data analysis to determine factors that also play a role in enhancing gains in mathematics learning apart from home languages.

If mathematics learning is to be improved in these districts, it is recommended that teachers who share with pupils the same home language teach pupils in their home language.

References

Austin, JL and Howson, AG (1979) Language and Mathematical Education. *Educational Studies in Mathematics*. Vol 10:2 p162-197

Baddley, G (1985) Language in Mathematics classroom teaching. *Mathematical Education for Teaching*. Vol 4: 4 p2-4

Chichewa Board, (1994) Why Chichewa was Chosen a National Language: *A Summarised Report on Research done from 24 - 25 June, 1993*. Chancellor College, Zomba (Unpublished)

Cocking, RR and Mestre, JP (Ed) (1988). *Linguistic and Cultural Influences on Learning Mathematics*. New Jersey: Lawrence Erlbaum Associates, Publishers

Ministry of Education, (1996). Press Release: Teaching Standards 1 to 4 in local languages or mother tongue. *The National Newspaper of 25th June, 1996*. Lilongwe, Malawi